

Converting Prius Fleet Vehicles to Plug-In Electric Vehicles

Part of the Electrification of Transportation Program of the City of San Antonio



Prius Plug-In Hybrid Program

In 2010, the City of San Antonio's Office of Environmental Policy received funding from the State Energy Conservation Office (SECO) to implement a Plug-In Hybrid Pilot Program.

Under the pilot program, the City converted five of its second-generation Toyota Priuses into plug-in electric vehicles. The grant also supported five dedicated electric vehicle charging stations for the vehicles which were assigned to different City departments..

ZWHEELZ was the local firm selected to convert the Priuses. The EPA-certified Hymotion conversion kits from A123 Systems were used. Craig Egan and Gary Krysztopik of ZWHEELZ worked with an A123 Systems technician to become San Antonio's only certified Prius conversion specialists.

Once converted, the Prius typically has twice the gasoline mileage experienced by the automobile prior to the conversion.

The Hymotion conversion kit features a 5 kWh lithium iron phosphate (LiFePO₄) battery designed to extend the use of the original nickel-metal hydride (NiMH) Prius battery (which remains in the vehicle).



City-owned Prius converted by ZWHEELZ to plug-in hybrid vehicle being charged by AeroVironment charger installed by Alterman Electric.

The Hymotion battery fits in the spare tire well and storage area under the rear deck cover.

A converted vehicle is capable of operating in the electric mode longer than the unmodified vehicle. For example, the supplemental battery allows the Prius to accelerate with electric power up to 34 miles per hour while the unconverted Prius will accelerate

with electric power only up to 9 miles per hour.

The only way to charge the Hymotion battery is to plug it into a conventional 110 Volt outlet. Once the Hymotion battery is fully depleted, the vehicle operates like a normal Prius.

The Hymotion battery takes 4.5 to 5 hours to totally charge.

Why Electric Transportation?

Electric transportation reduces dependence on expensive imported petroleum and lessens the impact of fossil fuels on the environment.

When fueling a gasoline or diesel vehicle, nearly 60¢ of every \$1.00 leaves the local economy. Recharging an electric car with power from CPS Energy, on the

other hand, keeps more of that money here. Plus, a motorist will save about \$100 per month in fuel costs.

Since vehicle charging mostly occurs at night, more power plants are not needed. With only 34% of CPS electricity coming from coal, electric cars are clean and will get cleaner as CPS adds more wind and solar to its energy portfolio and reduces coal power plant emissions.

Five Electric Vehicle Chargers

The City of San Antonio contracted with AeroVironment to provide the chargers which were installed by the local electrical contractor Alterman Electric.

The standard charging equipment provided by AeroVironment was enhanced for this project by including another charging option. This was done with an added 110 Volt NEMA 5-15R 20A GFI outlet with a meter that displays cumulative kWh for each charger. These changes permit the electric power being used by the plug-in Priuses to be monitored.

CPS Energy provided local funds to match the grant and will work with the City to monitor the electric consumption of the converted vehicles. The data collected will be included in a final summary report to SECO.



A ZWHEELZ photo of an A123 Systems Hymotion kit being installed in a City Prius.



Accumulative kWh meter for the charger installed by Alterman Electric at the City's Fleet Maintenance and Operations Facility.

Terms to Know

Hybrid Electric Vehicle (HEV): a vehicle powered by both an internal combustion engine and an electric motor that uses energy stored in a battery.

Plug-In Hybrid Electric Vehicle (PHEV): a HEV with a battery that can be charged by an external source of electricity.

Battery Electric Vehicle (BEV): an electric vehicle that is powered only by battery.

Electric Vehicle Supply Equipment (EVSE): The equipment used to charge the batteries of plug-in hybrids and other electric vehicles.

Level 1 EVSE: Charging through a 110/120 Volt AC circuit. Adds about 2-5 miles of range per hour of charging time.

Level 2 EVSE: Charging through a 220/240 Volt AC circuit. Adds about 10-20 miles of range per hour of charging time.

DC Fast Charging: With 480 Volt AC going into the EVSE, high voltage DC charges the car. 60 to 80 miles are added in 20 minutes of charging.

